TITLE:

HOW DIFFERENT LOADING SPORTS AFFECT BONE DEVELOPMENT DURING ADOLESCENCE AND HOW TO IMPROVE IT? THE PRO-BONE STUDY FINDINGS

ABSTRACT

Background: Adolescence is a crucial period for bone development and exercise can optimise bone health however, there is a lack of scientific evidence on how popular sports of different loading can affect bone development during adolescence and how it can be improved. **Objectives:** The PRO-BONE study aimed to (1) investigate the cross-sectional (baseline) and longitudinal (12-months) effects of football (weight-bearing sport), swimming and cycling (non-weight-bearing sports) on bone mass, bone geometry, bone texture and bone stiffness in adolescent males; and to (2) examine the effect of a 9-month jumping intervention programme on bone acquisition in adolescent males involved these sports. **Methods:** A total of 121adolescent males (41 swimmers, 37 footballers, 29 cyclists and 14 controls) aged 12-14 years at baseline were measured at three time points over 21-months (baseline, 12-months and 9-months of jumping intervention). Bone mineral content (BMC) and density (BMD) were measured using dual-energy x-ray absorptiometry (DXA) at total body, femoral neck and lumbar spine. Bone geometry and texture were measured using hip structural analysis and trabecular bone score respectively. Bone stiffness was measured using quantitative ultrasound. **Results:** The baseline findings showed that footballers have significantly better bone status than swimmers, cyclists and controls (7 to 21 %). The 12-months findings show that development of BMC (5 to 8 %) and geometry (4 to 10 %) is significantly higher in adolescent male footballers compared to swimmers and cyclists. The 9-month jumping intervention improved the acquisition of BMC, geometry and texture in adolescent males involved in swimming and cycling (4 to 13 %), but not in those engaged in football. **Discussion/Conclusion:** Collectively, the PRO-BONE study indicates that adolescents participating in football have higher bone status and development than cyclists and swimmers, and that a 9-month jumping intervention can improve bone development in those involved in non-weight-bearing sports.